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Confirmatory Factor Analysis of the Clinician-Administered PTSD Scale: Evidence for the Dimensionality of Posttraumatic Stress Disorder

Daniel W. King
Boston Department of Veterans Affairs Medical Center
and Boston University School of Medicine

Gregory A. Leskin
Boston Department of Veterans Affairs Medical Center
and Tufts University School of Medicine

Lynda A. King
Boston Department of Veterans Affairs Medical Center
and Boston University School of Medicine

Frank W. Weathers
Boston Department of Veterans Affairs Medical Center
and Auburn University

The Clinician-Administered PTSD Scale (CAPS; Blake et al., 1990) is a structured interview that assesses the 17 key symptoms of posttraumatic stress disorder (PTSD) as established in *the Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM–IV*; American Psychiatric Association, 1994). CAPS data from 524 treatment-seeking male military veterans were submitted to confirmatory factor analysis to test a series of nested models reflecting alternative representations of PTSD dimensionality: (a) a 4-factor, 1st-order solution; (b) a 2-factor, higher order solution; (c) a single-factor, higher order solution; and (d) a single-factor, 1st-order solution. The model of best fit was the 4-factor, 1st-order solution, containing moderately to highly correlated yet distinct 1st-order factors corresponding to the reexperiencing, effortful avoidance, emotional numbing, and hyperarousal aspects of PTSD. Implications for theory, assessment, and future research are presented in this article.

Posttraumatic stress disorder (PTSD) is an anxiety disorder that may result from a strong emotional reaction to extraordinarily stressful events. According to the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM–IV*; American Psychiatric Association, 1994), the classic clusters of PTSD symptoms are reexperiencing the event (Criterion B; e.g., intrusive thoughts, nightmares), avoidance of cues and reminders of the event and emotional numbing (Criterion C; e.g., avoidance of people and places, detachment), and hyperarousal (Criterion D; e.g., exaggerated startle, hypervigilance). Associated features of the disorder include suicidal ideation, hostility, and risky behavior.

An increasingly prominent measure of PTSD, used in a wide range of clinical and research settings and cited in almost 100 publications, is the Clinician-Administered PTSD Scale (CAPS; Blake et al., 1990). Designed for use by mental health professionals, this structured interview assesses the frequency and intensity of the 17 individual *DSM–IV* symptoms of PTSD with 5-point (0 to 4) Likert-type rating scales. Frequency and intensity ratings may be summed for each symptom to yield a severity score (0 to 8) and across symptoms to yield scores for the reexperiencing, avoidance and numbing, and hyperarousal clusters. In addition, a total PTSD severity score may be computed by summing across ratings for all 17 symptoms.

The CAPS has a sound record with regard to reliability and validity. In a series of psychometric inquiries, Weathers, Blake, et al. (1997) administered the CAPS, the PTSD module of the Structured Clinical Interview for *DSM–III–R* (SCID; Spitzer, Williams, Gibbon, & First, 1990), and a variety of self-report measures of PTSD and other disorders to 123 Vietnam veterans. Sixty of the veterans were also administered a second CAPS by an independent clinician 2 to 3 days later. Coefficients of stability and equivalence ranged from .77 to .96 for symptom cluster severity scores and from .90 to .98 for total severity scores. Internal consistency was .94 for the full scale and ranged from .85 to .87 for the three symptom clusters. Further, the CAPS demonstrated strong convergent validity, correlating .91 with the Mississippi Scale for Combat-Related PTSD (Keane, Caddell, & Taylor, 1988), .77 with Keane's PTSD (PK) scale of the MMPI–2 (Lyons & Keane, 1992), and .89 with the number of PTSD symptoms on the SCID. With a total severity score cutoff of 65, sensitivity was .84, specificity was .95, and efficiency was .89 against an SCID PTSD diagnosis. A more recent analysis (Weathers, Ruscio, & Keane, 1997) indicated that a variety of CAPS scoring rules yielded Cohen's kappa coefficients ranging from .63 to .75 with the use of the SCID PTSD diagnosis as the criterion.

The present study addressed the latent or factor structure of

Daniel W. King, Behavioral Science Division, National Center for Posttraumatic Stress Disorder, Boston Department of Veterans Affairs Medical Center, and Boston University School of Medicine; Gregory A. Leskin, Behavioral Science Division and Women's Health Sciences Division, National Center for Posttraumatic Stress Disorder, Boston Department of Veterans Affairs Medical Center, and Tufts University School of Medicine; Lynda A. King, Women's Health Sciences Division, National Center for Posttraumatic Stress Disorder, Boston Department of Veterans Affairs Medical Center, and Boston University School of Medicine; Frank W. Weathers, Behavioral Science Division, National Center for Posttraumatic Stress Disorder, Boston Department of Veterans Affairs Medical Center, and Department of Psychology, Auburn University.

Correspondence concerning this article should be addressed to Daniel W. King, Behavioral Science Division (116B-2), National Center for Posttraumatic Stress Disorder, Boston Department of Veterans Affairs Medical Center, 150 South Huntington Avenue, Boston, Massachusetts 02130-4893. Electronic mail may be sent to king.daniel@boston.va.gov.

the CAPS. To our knowledge, a factor analysis of this instrument has yet to be reported in the published literature. Because the CAPS closely adheres to the official *DSM–IV* criteria and has the advantage of being administered by clinicians trained in PTSD assessment, information about its factor structure could yield valuable insight into the dimensionality of the PTSD construct itself. We applied contemporary theory and empirical findings regarding the structure of PTSD to the formulation and testing of competing models through confirmatory factor analysis. The following four models were specified, proceeding from the most saturated (having the largest number of parameters to be estimated) to the least saturated (having the smallest number of parameters to be estimated):

1. The first model (Figure 1A) was a *four-factor, first-order solution*. Although *DSM–IV* postulates three symptom clusters, with effortful avoidance and emotional numbing constituting a single Criterion C category, there is growing evidence that these aspects of PTSD represent distinguishable elements. For example, Litz (1992) asserted the importance of emotional numbing as a phenomenologically distinct entity, and Litz et al. (1997) treated avoidance and numbing as separate concepts in their examination of the structures underlying PTSD. On the basis of an exploratory factor analysis, Foa, Riggs, and Gershuny (1995) likewise concluded that avoidance and numbing, though functionally similar, embody separate mechanisms. Finally, King and King's (1994) confirmatory factor analysis of the Mississippi Scale (Keane et al., 1988) supported the disaggregation of avoidance and numbing to different first-order factors. Hence, the multifactorial representation of CAPS data in Figure 1A contains four correlated primary dimensions: reexperiencing, effortful avoidance, emotional numbing, and hyperarousal.

2. The second model (Figure 1B) was a *two-factor, higher order solution*, with two correlated second-order latent variables. The model integrates previous attempts to characterize PTSD in terms of reciprocal relationships between symptom dimensions. One higher order factor subsumes reexperiencing and effortful avoidance. The other subsumes hyperarousal and emotional numbing. This structure is based on the theoretical position that the clinical manifestations of PTSD follow a pattern of oscillations between the elements within these two pairs of symptom categories. That is, effortful avoidance of cues and reminders of the trauma serves to thwart intrusive thoughts or episodes of reexperiencing (Foa et al., 1995; Horowitz, 1986; McFarlane, 1992). Similarly, lack of emotional responsiveness and social withdrawal are called on to counter tendencies toward arousal, irritability, and rage (Foa et al., 1995; Litz, 1992).

3. The third model (Figure 1C) was a *single-factor, higher order solution*, with reexperiencing, effortful avoidance, emotional numbing, and hyperarousal as first-order factors, all subsumed by a global second-order factor. This model preserves a degree of differentiation among symptom clusters and concomitantly endorses a more unidimensional concept of PTSD symptoms than in the prior two models. It portrays the disorder as a unitary syndrome manifest by four symptom clusters and harkens to the structure proposed and supported by King and King (1994) in their confirmatory factor analysis of the Mississippi Scale. These authors documented and replicated a second-order PTSD factor that governs responses to items organized around the first-order factors of reexperiencing and situational avoidance, withdrawal and numbing, arousal and lack of control, and guilt and suicidality.

4. The fourth model (Figure 1D) was a *single-factor, first-order solution*, with all 17 symptoms loading on a common PTSD factor. Here, a parsimonious, single latent variable is postulated to be responsible for all observed manifestations of the disorder.

Method

Data were obtained from 524 male veterans who were evaluated at the National Center for PTSD, Boston, between 1990 and 1996. The CAPS was administered by doctoral-level staff and psychology predoctoral interns as part of a standard assessment battery. The complete database contained both *DSM–III–R* and *DSM–IV*-based CAPS; to make all data consistent with the more contemporary *DSM–IV*, the item assessing physical reactions to cues or reminders of the trauma was assigned to Criterion B (reexperiencing).

On presentation for initial evaluation, about half of the veterans (49%) had some type of official service-connected disability rating for either physical or psychiatric problems; 14% were receiving compensation for PTSD. For those veterans with final diagnoses recorded in the database (n = 372), 70% were listed as PTSD-positive at the conclusion of a multimodal assessment. For those diagnosed with PTSD, CAPS severity scores were significantly higher (M = 82.34, SD = 16.76) than for those without the diagnosis (M = 48.31, SD = 20.21), $t(370) = 16.78$, $p < .001$. This comparison accounted for a rather large proportion of variance in CAPS scores ($\text{eta}^2 = .43$), thus lending support for the diagnostic validity of the CAPS in this sample.

In addition, the large majority of the sample (n = 399) were administered the Combat Exposure Scale (Keane et al., 1989) to measure the veterans' judgments of wartime stressor experiences. Their mean (25.70) and standard deviation (10.40) on this instrument were almost identical to the mean (25.57) and standard deviation (10.12) documented by Keane et al. for their treatment-seeking test development sample. Of the total of 524 study participants, 75 (14%) previously were used by Weathers et al. (1996) to investigate the utility of the Symptom Checklist (SCL)-90-R (Derogatis, 1983) as a measure of PTSD, with CAPS-based diagnoses serving as the criterion. The average age of participants in the present study was approximately 51 years (range = 22 to 75), with a standard deviation of 8.60. Table 1 presents a profile of the sample's additional demographic characteristics. Overall, the study participants demonstrated a great deal of diversity and dispersion, which is advantageous in psychometric procedures, including factor analysis, as it promotes variability in scores, the attainment of more precise item and factor characteristics, and ultimately greater generalizability of findings.

A sequence of nested measurement models was specified, beginning with the most saturated model (the four-factor, first-order solution) and proceeding to the more parsimonious models with reduced numbers of parameter estimates (the two-factor, higher order solution; then the single-factor, higher order solution; and finally the single-factor, first-order solution). For all analyses, the Amos software package (Arbuckle, 1997) was used. Matrices of covariances among CAPS item severity scores were analyzed by use of maximum likelihood estimation. Each item was specified to load on a single factor, and covariances among residuals were constrained to zero.

Results and Discussion

Table 2 presents the results of the chi-square difference tests evaluating the four competing models and fit indices specifically designed for model comparisons. The information provided points to the four-factor, first-order solution (Figure 1A) as the most acceptable representation of the CAPS factor structure.

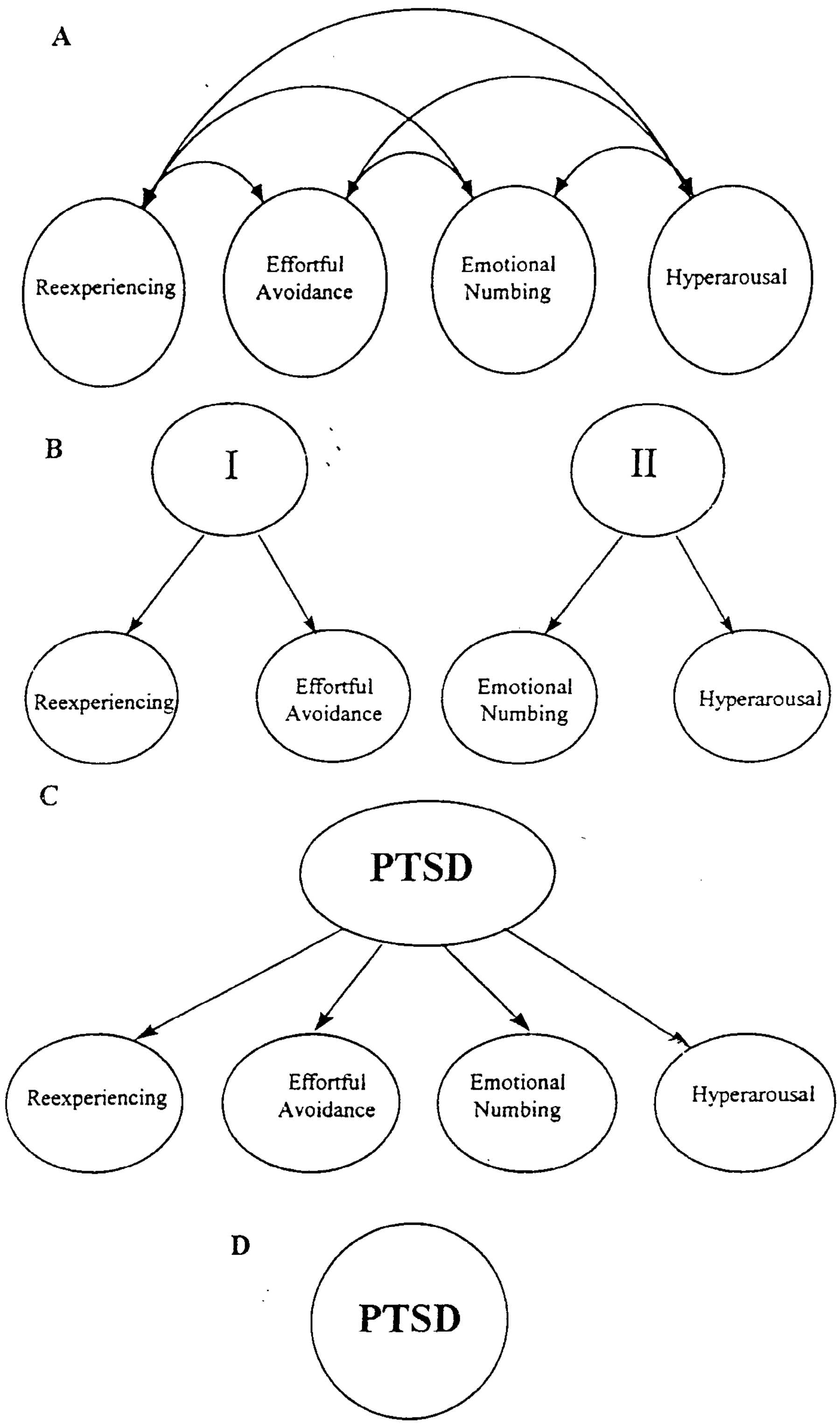

Figure 1. (A) Four-factor, first-order solution; (B) two-factor higher order solution; (C) single-factor, higher order solution; (D) single-factor, first-order solution. All depictions are simplified, with manifest indicators and disturbances not shown. PTSD = posttraumatic stress disorder.

The changes in the chi-square values used to contrast progressively more constrained models ($\Delta\chi^2$s) were all significant, and the chi-square value for the most saturated four-factor, first-order solution differed significantly from the chi-square values of the other models. Therefore, the fit of the other solutions to the data was less optimal. The accepted four-factor, first-order model is judged best able to reproduce the population-based matrix of associations among observed CAPS scores. Also, the

Table 1
Sample Profile

Demographic variable	%	Demographic variable	%
Premilitary education (highest grade completed)		War-zone duty (*continued*)	
Less than 8th grade	>1	Two tours	15
9th grade	5	Three tours	3
10th grade	11	None	5
11th grade	10	Race/ethnicity	
12th grade	9	Caucasian	82
Some college	42	African American	13
Graduated college	13	Hispanic	2
GED	9	American Indian/Alaskan Native	2
Military era		Asian American	>1
World War II	7	Employment status	
Korean War	5	Full- or part-time	42
Vietnam War	81	Student	9
Operation Desert Storm	4	Unemployed	33
Other	3	Retired/disabled	16
Branch of service		Current yearly income	
Army	46	\$0–10,000	55
Marine	31	\$10,001–15,000	11
Navy	10	\$15,001–20,000	8
Air Force	7	\$20,001–25,000	6
Other	3	\$25,001–30,000	8
War-zone duty		\$30,001–40,000	8
One tour	77	\$40,001–50,000+	4

Note. GED = general equivalency diploma.

fit indices tend to endorse the four-factor, first-order solution. As prescribed by Jöreskog and Sörbom (1993) and Browne and Cudeck (1993), among others, the smallest value among competing solutions is preferred. Such is the case for three of the four indices: the Akaiki information criterion (AIC; Akaike, 1987); the root mean square error of approximation (RMSEA; Steiger, 1990); and the expected cross-validation index (ECVI; Browne & Cudeck, 1989), derived from the RMSEA.

For the accepted model, the goodness-of-fit-index (Jöreskog & Sörbom, 1993) was .95; the comparative fit index (Bentler, 1990) was .95; the incremental fit index (Bollen, 1989) was .95; and the parsimony normed fit index (James, Mulaik, &

Table 2
Fit Indices and Sequential Chi-Square Difference Tests for Nested Models (N = 524)

Model	χ^2 (*df*)	$\Delta\chi2$ (*df*)	*p*	AIC	CAIC	RMSEA	ECVI
		Accepted model					
I. Four-factor, first-order solution	228.86 (113)			308.86	519.32	.044	.59
		Alternative models					
II. Two-factor, higher order solution	232.97 (114)			310.97	516.16	.045	.60
III. Single-factor, higher order solution	242.89 (115)			318.89	518.82	.046	.61
IV. Single-factor, first-order solution	471.82 (119)			539.82	518.72	.075	1.03
		Difference between models					
Model I and Model II		4.11 (1)	.04				
Model II and Model III		9.92 (1)	.00				
Model III and Model IV		228.94 (4)	.00				
Model I and Model III		14.03 (2)	.00				
Model I and Model IV		242.97 (6)	.00				

Note. RMSEA = root mean square error of approximation; AIC = Akaike information criterion; CAIC = corrected Akaike information criterion; ECVI = expected cross-validation index.

Table 3
Factor Loadings and Relationships Among Factors

Item and factor	Maximum likelihood estimates Factor 1	Factor 2	Factor 3	Factor 4	Standardized disturbances
			Weights[a]		
B1. Intrusive recollections	.67/1.00				.55
B2. Distressing dreams	.60/.89 (.08)				.65
B3. Reliving/flashbacks	.58/.83 (.07)				.67
B4. Distress toward cues	.69/.83 (.06)				.53
B5. Reactivity toward cues	.70/1.00 (.07)				.50
C1. Avoid thoughts/feelings		.68/1.00			.54
C2. Avoid people/places		.62/1.00 (.10)			.62
C3. Amnesia			.27/.37 (.07)		.93
C4. Diminished interest			.61/.80 (.06)		.63
C5. Detached from others			.77/.92 (.06)		.41
C6. Restricted range of affect			.76/1.00		.43
C7. Foreshortened future			.51/.77 (.07)		.74
D1. Disturbed sleep				.55/1.00	.70
D2. Anger outbursts				.53/.84 (.09)	.72
D3. Poor concentration				.57/1.01 (.10)	.68
D4. Hypervigilance				.59/1.04 (.10)	.66
D5. Exaggerated startle				.56/.96 (.10)	.69
		Relationships among factors[b]			
1. Reexperiencing	**3.06**	2.28	1.99	2.10	
2. Effortful avoidance	.81	**2.60**	1.78	1.57	
3. Emotional numbing	.60	.58	**3.65**	1.82	
4. Hyperarousal	.92	.74	.73	**1.71**	

[a] Standardized followed by unstandardized loadings, with standard errors in parentheses. One item within each factor was fixed at 1.00 to establish the scale; hence, there are no standard errors for these four items. [b] Diagonal contains variance (in boldface type); upper triangle contains covariances; lower triangle contains correlations, all of which are significant.

Brett, 1982) was .76, all supporting strong model–data fit. Also, the point estimate of RMSEA, .044 (90% confidence interval = .036–.053), was less than the recommended .05 value indicative of good fit, with a probability of .87 that its true value is less than .05 (Browne & Cudeck, 1993).

Weights for the regressions of item severity scores on their respective factors appear in Table 3. Most were high: with the exception of Item C3 (amnesia), all standardized values exceeded .50. Amos critical ratios ranged from 5.66 to 15.04; all but the one associated with Item C3 exceeded 9.00. Typically, a critical ratio greater than 2.00 is considered indicative of a substantial relationship. It is not surprising to find a relatively weak relationship between the amnesia symptom and the emotional numbing factor. The other numbing symptoms (Items C4–C7) may be viewed as more fear-based and affectively laden learned responses to a traumatic event (e.g., Foa & Kozak, 1986), whereas psychogenic amnesia has been conceptualized as the result of more automatic coincident processes that occur at the time of exposure (e.g., Pitman, 1989). Weak factor loadings for PTSD items reflecting memory difficulties have been documented in factor analyses of other PTSD measures. For example, King, King, Leskin, and Foy (1995) found that the "difficulty with memory" item from the Los Angeles Symptom Checklist had a low loading on all three factors extracted in a principal axis analysis. Also, Lauterbach, Vrana, King, and King's (1997) confirmatory factor analysis of the 39-item Civilian Mississippi Scale yielded a weak relationship between an item addressing inability "to remember important events" and a withdrawal and numbing factor. It may be that this particular feature of PTSD is quite difficult to assess; that is, people with memory problems or amnesia may not be able to reliably or accurately report what they cannot remember. Alternatively, the weak relationship between the amnesia item and emotional numbing could suggest the possibility of a fifth memory difficulties factor. Nonetheless, with some reservation about Item C3, the full set of CAPS symptom severity scores appears to index the hypothesized factors in a satisfactory manner.

Table 3 also contains indexes of the relationships among the factors. The correlations ranged from .58 (between effortful avoidance and emotional numbing) to .92 (between reexperiencing and hyperarousal). Thus, there was a fair amount of variability in the factor associations. The strong relationship between reexperiencing and hyperarousal may well capture the essence of a hallmark quality of PTSD: the convergence of intrusive remembrances of the traumatic event with the intense emotional reactions associated with them. It is noteworthy that the weakest relationship among the four latent factors was between the two aspects of PTSD that *DSM–IV* links together into a single criterion (Criterion C's effortful avoidance and emotional numbing).

What conclusions might be drawn about the structure underlying the CAPS and perhaps the nature of PTSD? First, this study did not support a unifactorial representation of PTSD. Neither a first-order latent variable responsible for all 17 symptom severity scores (Figure 1D) nor a single second-order latent variable responsible for scores on the symptom clusters (Figure 1C) was the best explanation for the observed data. Second, the two-factor, higher order solution tested in this study (Figure 1B) was not the model of choice. Indeed, the correlations among the factors in the four-factor, first-order solution (Table 3) suggest that no other meaningful pairing of symptom clusters would yield any better two-factor, higher order solution. For example, a post hoc analysis of a model specifying a "positive symptoms" higher order factor subsuming reexperiencing and hyperarousal and a "negative symptoms" higher order factor subsuming effortful avoidance and emotional numbing produced the following fit indices: $\chi^2(115, N = 524) = 248.67$, AIC = 342.67, CAIC = 524.61, RMSEA = .047, and ECVI = .62. These values demonstrate weaker fit than the two-factor, higher order model actually proposed and tested in this study.

In the end, the model of best fit, the four-factor, first-order solution, suggests a set of moderately to highly correlated but separate symptom dimensions that together may be viewed as a PTSD syndrome. This finding implies that more emphasis be placed on the symptom cluster scores of the CAPS and, more generally, on distinct assessment procedures for the several aspects of PTSD. Furthermore, it argues for possible subtypes of PTSD, with individuals displaying different patterns of symptom combinations.

To explore relationships between the four CAPS factors and other measures, we conducted an additional set of post hoc regression analyses with data from subsets of the sample. The bivariate correlations between the sums of item severity ratings within each CAPS factor and state anxiety scores (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) ranged from .29 to .47 ($n = 274$). As expected, the higher correlations were between anxiety and hyperarousal (.47) and between anxiety and reexperiencing (.45). Correlations with scores on the Beck Depression Inventory (Beck, 1978) ranged from .31 to .44 ($n = 389$), with the largest coefficients for the emotional numbing–depression and hyperarousal–depression relationships (both .44). These findings are reasonably consistent with expectations because we would anticipate a stronger relationship between numbing and depression and because numbing and arousal were moderately related. Further, multiple regression demonstrated that reexperiencing, emotional numbing, and hyperarousal contributed significantly and uniquely to state anxiety, and emotional numbing and hyperarousal contributed significantly and uniquely to depression. Thus, in addition to what the four CAPS predictors commonly share with anxiety and depression, there is evidence for differential associations attributable to aspects particular to each.[1]

An overriding clinical implication of this study is that treatment programs and their evaluation should be multifaceted, with separate components targeting each of the PTSD symptom categories. Future research might focus on how etiological factors, including the nature of the trauma, vulnerabilities, and features of the posttrauma environment are differentially implicated for the four PTSD symptom clusters. Moreover, the structure documented here on a sample of male veterans should be replicated on samples of people exposed to other traumas (e.g., victims of interpersonal violence, those experiencing human-created or natural disasters) and on female or mixed-gender samples to enable generalization of findings about potential mechanisms underlying PTSD.

[1] Details on these bivariate and multiple regression analyses may be obtained from Daniel W. King.

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